

## The Role of Oral Disease in Systemic Disorders



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## The Role of Oral Disease in Systemic Disorders- Objectives:

- Identify at least 4 systemic disorders associated with periodontitis.
- Describe the strength of the associations for these disorders.
- List 2 dental interventions and patient responsibilities for controlling oral infection.

## Attention Grabbers from News Outlets:

- “Floss or Die!”
- “By Gum, Your Life is in Danger”
- “Are My Bad Teeth Killing Me?”
- “Severe Gum Disease May Hasten Death”
- “The Checkup That Can Save Your Life”

**Is there any basis to these claims?**

## Oral Disease and Systemic Disorders

Periodontitis has an association with:

- Infective Endocarditis
- Diabetes
- Cardiovascular Disease
- Pre-Term, Low Birth Weight Infants
- Pulmonary Disease
- Others

## Infectious diseases can cause changes at distant body sites.

“Focal Infection Theory” in the 1920’s-1940’s.

The oral cavity is a portal of entry as well as the site of disease for microbial infections that affect general health status.

Surgeon General’s Report on Oral Health in America, 2000

The mouth can become a source of disease or pathological processes affecting other parts of the body.....

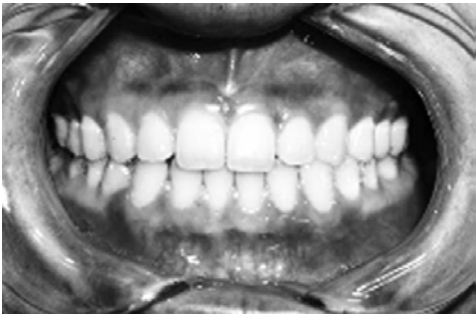
Surgeon General’s Call to Action to Promote Oral Health, 2003

## Common infections in the oral cavity

- Caries
- Periapical lesions- nonvital teeth
- Fungal and viral infections
- Gingivitis
- Periodontitis



Healthy periodontium



Localized gingivitis



Localized moderate gum disease (periodontitis)



Localized Severe Periodontitis



Generalized, severe gum disease (periodontitis)



Prevalence of periodontitis:

Conservative estimate, US adults with teeth:

- 22%- mild form
- 13%- moderate to severe form

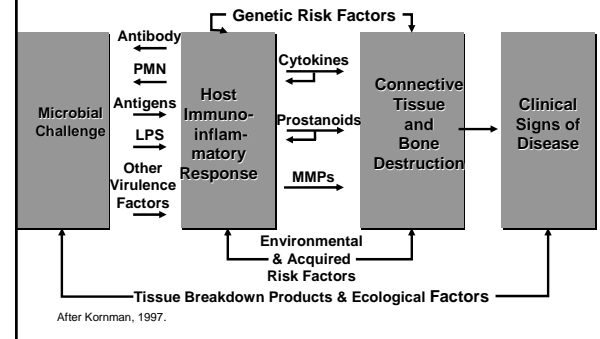
NHANES III, n=9689

Albandar JP 1999

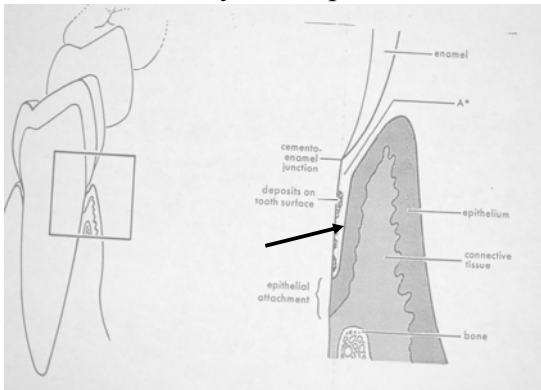
## What causes periodontitis?

Periodontitis is a gum infection, initiated by specific bacteria that activate a series of inflammatory and immunologic changes leading to destruction of connective tissue and bone, and possible loss of teeth.

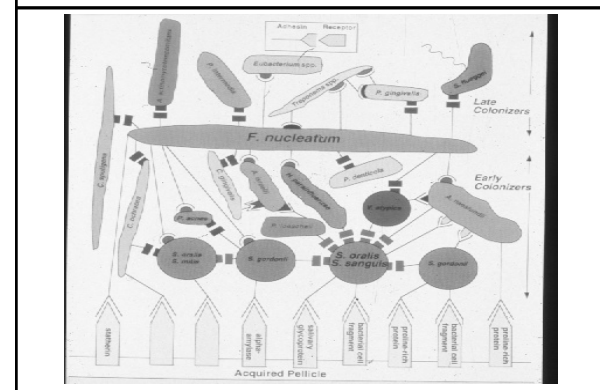
## Pathway to Periodontal Disease



## Anatomy of the pocket



## Biofilm Bacteria



## Oral Disease and Systemic Disorders

Periodontal disease needs to be viewed more broadly in terms of systemic inflammation, either as a consequence of an underlying hyperinflammatory trait or as a factor contributing to systemic inflammation.

Slade, Offenbacher, Beck et al  
J. Dent Res 2000

## Periodontitis and Systemic Inflammation

- Pro-inflammatory cytokines (IL-1, IL-6, TNF- $\alpha$ ) and prostaglandins (PGE<sub>2</sub>) accumulate in the gum tissues in active periodontitis at extraordinary levels and can enter the circulation. Salvi 1997
- Periodontitis is an anaerobic infection flooding the blood stream 24 hours a day with endotoxins and inflammatory mediators. Offenbacher, 1998
- Periodontitis is asso. with increased serum C-Reactive Protein, and periodontal treatment decreases systemic inflammation (CRP, IL-6, TNF- $\alpha$ ). Genco 1998 Mattila 2002

### **Periodontitis and Systemic Inflammation**

- 55% of patients with severe periodontitis manifest positive arterial blood cultures after chewing parafin.

Murray 1941

- Leukocytes are slightly elevated in patients with periodontitis compared to controls (dose dependent), and leukocytes decrease after therapy.

Christan 2002, Fokkema 2003

### **Moderate periodontitis**



Estimated 10-20cm<sup>2</sup> ulcerated surface and area of tissue necrosis  
Hujoel 2001

4 cm<sup>2</sup> foot ulcer- smaller than the ulcerated epithelium within infected periodontal pockets



### **Gum Disease is usually painless**



Periodontal infection and inflammation  
Needs deep cleaning (scaling and root planing)



2 months after the scaling and root planing,  
infection and inflammation resolved.





#### Oral Disease and Systemic Disorders

Periodontitis has an association with:

- **Infective Endocarditis**
- Diabetes
- Cardiovascular Disease
- Pre-Term, Low Birth Weight Infants
- Pulmonary Disease
- Others

#### Bacterial Endocarditis-

**Bacteria enter the bloodstream and infect damaged heart valves or endocardium.**

- Systemic antibiotics are provided prior to dental treatment to prevent bacteremia complications.
- % of patients who had recent dental treatment varies widely from 3%-40%.
- Many cases of endocarditis are probably caused by dental disease, mastication, and oral hygiene procedures, not by dental treatment.

#### Periodontitis and Surgical Complications

“The bacteria from periodontitis can enter the blood stream and cause systemic complications ... and compromise recovery from any surgery, particularly patients receiving implants, transplants, or replacements of body parts since it may cause these procedures to fail.”

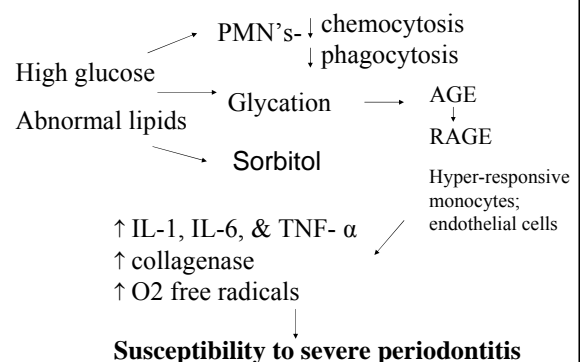
Dr. Gordon Douglas, President AAP, 9/2003

#### Oral Disease and Systemic Disorders

Periodontitis has an association with:

- Infective Endocarditis
- **Diabetes**
- Cardiovascular Disease
- Pre-Term, Low Birth Weight Infants
- Pulmonary Disease
- Others

#### Periodontal destruction associated with diabetes



## Epidemiologic Studies in the Pimas:

Shlossman, Emrich, Knowler, Nelson and others

- Diabetics had more severe periodontitis than non-diabetics.
- Destructive periodontitis occurred much earlier in life in the diabetics (27% of diabetics 15-19 years old).
- Diabetics were 15X more likely to lose all their teeth.

## Diabetes and Periodontitis

A recent review of 55 studies involving subjects with diabetes found consistent evidence of greater periodontitis:

- Prevalence
- Incidence
- Severity
- Extent
- Progression

**Dose-response relationship- as glycemic control worsens, periodontitis worsens.**

Taylor, CCED 2004

## The 2 Way Relationship:

- Diabetes increases risk for periodontitis.
- Does periodontitis increase risk for poorer glycemic control?

## Severe Periodontitis and Risk for Poor Glycemic Control in Subjects with NIDDM

Patients were twice as likely to have a worsening of HbA1c over 2-3 years when severe periodontitis was present at baseline.

Pima study. Taylor et al, J Perio 96

Findings confirmed in Type 2 DMs with severe perio disease compared to Type 2 DMs without periodontitis. Collins 1998

## **Periodontal disease is a strong predictor of mortality from ischemic heart disease and diabetic nephropathy in Pimas with type 2 diabetes.**

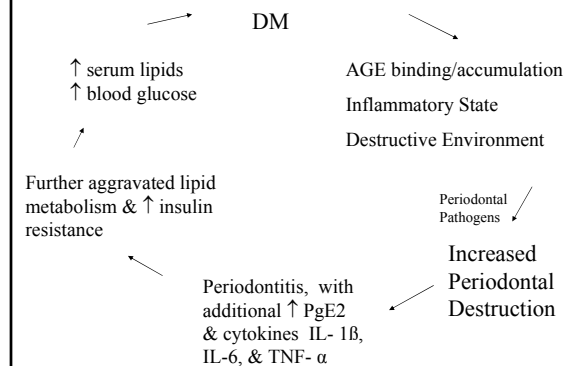
- Prospective longitudinal study (median 11 years) on the effect of periodontitis on cardiovascular mortality.
  - After adjusting for many factors, for IHD:
    - No/mild perio 0 deaths/1000 person-years
    - Moderate perio 4.8 deaths/1000 person-years
    - Severe perio 5.7 deaths/1000 person years
  - For deaths from diabetic nephropathy, there were 0, 0.5, and 5.3 deaths/1000 person-years for no, moderate, and severe perio respectively (p<0.01)
- (Severe perio = 3.2 X greater risk of cardiorenal mortality)**

Saremi et al, Diabetes Care 2005, n= 626

## Medical status and complications in relation to periodontal disease experience in insulin-dependent diabetics. Thorstensson J Clin Perio 1996

- Case-control study compared the medical status of diabetics with and without severe periodontitis; median F/U 6 years.
- There was a sig. higher prevalence of proteinurea and cardiovascular complications such as stroke, TIA, angina, and MI in those with severe perio at baseline.

### **DM and Periodontitis- The 2 Way Relationship**



### **Periodontal therapy aimed at eliminating infection and reducing inflammation can improve diabetic control, at least in the short term.**

- Williams and Mahan, JAMA 1960  
(Mean insulin decrease of 30 units)
- Grossi et al, J Perio 97, Pima study  
(Mean HbA1c 10% to 9% at 3 months)
- Stewart et al JCP 2001  
(Mean HbA1c 9.5% to 7.6% at 9 months)
- Iwawoto et al JP 2001  
(Mean HbA1c 7.9% to 7.1% 1 month post therapy)
- Rodrigues et al J Perio 2003  
(Mean HbA1c 9.5 to 9.2 and 8.8 to 7.6 at 3 months)
- Kuran et al JCP 2005  
(Mean HbA1c 7.3 to 6.5 at 3 months)

### **Periodontal treatment studies where no effect was seen on glycemic control:**

1. Fair to well controlled diabetics, &/or
2. No antimicrobials used during dental tx.

Aldridge et al, JCP 1995  
 Smith et al, J Perio 1996  
 Grossi et al, J Perio 1997  
 Christgau et al JCP 1998

### **Diabetic protocol in those with moderate to severe periodontitis**

- Intensive oral hygiene instruction
- 1/2 mouth ultrasonic scaling with local anesthesia
  - In deep pockets “until bony resistance is felt”
- Extract hopeless teeth
- Systemic antibiotic
  - Doxycycline 100mg bid X 14 or 21 days
- Chlorhexidine mouthrinse
- Analgesic
- Recall 2-6 months



### **Oral Disease and Systemic Disorders**

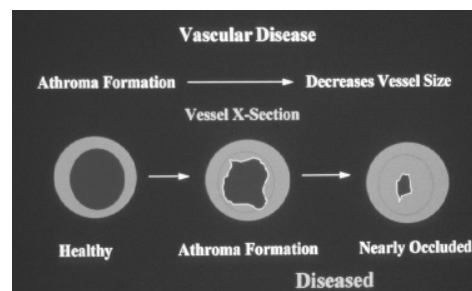
#### **Periodontitis has an association with:**

- Infective Endocarditis
- Diabetes
- **Cardiovascular Disease**
- Pre-Term, Low Birth Weight Infants
- Pulmonary Disease
- Others

## Periodontal bacteria increase risk for CVD thru several possible mechanisms:

- Bacteria or viruses from the mouth directly infect blood vessel walls and contribute to development of plaques and atherosclerosis.
- Bacteria or viruses interact with wbc's or platelets and trigger release of proinflammatory cytokines, prostaglandins, and TNF- $\alpha$   $\rightarrow$  CV plaques
- Bacterial products in the blood may stimulate liver production of proinflammatory or pro-coagulant molecules such as C-reactive protein and fibrinogen, exacerbating other ongoing inflammatory processes and increasing risk of atherosclerosis.

## Oral Disease and Systemic Disorders



## Periodontal pathogens are present in atherosclerotic plaques where they may play a role in the development and progression of atherosclerosis.

Human specimens from endarterectomies  
Bacteria found in 72% of the 50 specimens  
44% were positive for at least one perio pathogen.

Genco, J Perio 2000

## 88.5% (23 of 26) aorta samples during open heart surgery had bacterial DNA, many from perio pathogens

Stelzel J Perio 2002

## Perio infection with 4 periopathogens was associated with subclinical atherosclerosis (IMT) and the greater their proportion in the mouth the higher the likelihood of IMT.

INVEST, Desvarieux, Circulation 2005

## Increased Intima Medial Thickness of the ICA was found in healthy patients with severe periodontitis compared to healthy patients with moderate perio and controls.

Leivadaros J Perio 2005

## Periodontal infection accelerates atherosclerosis in animals

• In hypercholesterolemic mice infected with *Porphyromonas gingivalis*, *Pg* DNA localized in aortic tissue in many of the infected mice (but none of the non-infected), and there was a 30% increase in aortic lesion area in infected mice (vs non-infected).

Lalla 2003, Arteriosler, Thromb, Vasc Biol

• Pigs inoculated with *Pg* had elevated serum CRP and atheroma sizes compared with controls.

Brodala JDR 2002

• Rabbits inoculated with *Pg* had platelet clumping, thrombus and emboli formation, and increased chance for MI and stroke.

Herzberg 1998

**Conclusion:** *Pg* accelerates early atherosclerosis, and its eradication may be beneficial in reducing the progression of atherosclerosis.

## Liver acute phase response to systemic infection +/- inflammation

C- Reactive Protein levels have a strong linear relationship with the incidence of CV events

Ridker 1997, NEJM 2002

Pai NEJM 2004

Patients with periodontitis had sig greater serum elevations in systemic markers of inflammation (CRP, IL-6, and fibrinogen) compared with healthy controls.

Loos J Perio 2000, Slade JDR 2000, Noack JP 2001,

Periodontal disease progression is associated with significant increases in serum CRP.

Craig, J Perio 2003

Perio treatment decreases systemic inflammation

( $\downarrow$  CRP and TNF- $\alpha$ ) Genco 1998 Brown 2002 Mattila 2002

Ide 2003 D'Aiuto 2004 Montebugnoli 2005

## Liver acute phase response to systemic infection +/- inflammation

Periodontal infections contribute to elevated systemic CRP level (after adjusting for age, smoking, BMI, triglycerides and cholesterol):

Severe perio (Clinical Attachment Loss) 4.06 mg/l CRP

Perio healthy 1.70 mg/l CRP

The presence of perio pathogens (*Pg*, *Pi*, *Cr*, and *Bf*) was asso. with elevated CRP levels.

Noack JP 2001

Elevated high sensitivity serum CRP levels are asso with periodontitis in subjects with no evidence of CVD (as measured by bone loss, but not probing depth or attachment levels).

Persson JCP 2005



### **Epidemiological evidence**

Over 18 years, veterans with periodontitis were 1.9 X more likely to develop fatal heart disease and 3X more likely to have a stroke. (Adjusting for age, bp, DM, smoking, BMI, serum cholesterol, and education)

Cohort study, VA Dental Longit. Study, Beck 1996, 1998

In a population with low prevalence of smokers, those with periodontitis, under 60 years of age, followed for 10 years:

2.7 times more likely to have heart disease than those with no periodontitis.

**Periodontitis may be a stronger risk factor for heart disease than hypertension or high cholesterol.**

Genco et al '97

### **Examining the link between heart disease and the elimination of chronic dental infection.**

- People who had all teeth removed did not have a lower risk of developing CHD compared to people with periodontitis.
- Dental procedures should not be recommended for the purpose of lowering CHD risk.

Nhanes I to Nhanes I Follow Up (17 years)  
n >4000, 1238 CHD events, 538 fatal  
Hujuel, JADA 2001

### **Periodontitis and MI**

As extent of periodontal attachment loss increased, the odds of having a history of heart attack increased:

0-33% dental sites w att loss      Adjusted OR 1.37

33-67% dental sites w att loss      Adjusted OR 2.08

> 67% dental sites w att loss      Adjusted OR 3.20

Asso. between extent of periodontal attachment loss and self-reported history of heart attack.      Arbes 1999

X-sec, NHANES III data, n=5564, p=0.02. (Adjusted for age, sex, race, poverty, smoking, dm, htn, BMI, and serum cholesterol.)

### **Periodontitis and Acute MI**

- The combination of radiographic bone loss, bleeding gums, and deep probing depths showed good ability in identifying patients with a history of recent acute MI.
- Dose-response relationship between risk of periodontal "infectiousness" and presence of CAD. Adjusted OR 6.5 (adjusted for confounding factors such as amount smoked).

Renvert JCP 2004

Geerts JP 2004. Belgian pop, case control,  
n= 108 CAD, 62 controls

### **Epidemiological evidence- Measures of infection**

- High antibody levels to oral bacteria, an indicator of systemic exposure, were asso with prevalent CHD in current and former smokers as well as never smokers.
- Systemic exposure to more than 1 oral bacteria was related to a higher prevalence of CHD, especially in never smokers.
- Clinical signs of perio disease (probing depth, CAL) were not asso with CHD and may not represent the systemic burden of periodontitis.      Dental ARIC Study, Circulation, Beck 2005
- Stroke, CHD, and DM are asso with high periodontal bacteria presence and high antibody titer in comparison to those individuals with low antibody and low oral bacteria.

Dental ARIC. JP, Beck 2005.

Multivariate principle component analysis, looking at demographics, systemic conditions (dm, obesity, smoking, and HTN), and CV outcomes (CHD, stroke, IMT)

### **Epidemiological Evidence- Cerebrovascular Ischemia**

Poor dental status was independently asso with increased risk of cerebrovascular ischemia: OR 2.6

Stroke. Grau 1997

Periodontitis is a significant risk factor for

Nonhemorrhagic stroke:      OR 2.11

Fatal nonhemorrhagic stroke: OR 2.90

Edentulous      OR 1.41

Nhanes I to II (21 years). Wu 1999

**In men <60, subjects with severe periodontitis had a 4.3 fold higher risk for TIA or stroke than subjects with mild or no periodontitis.**

Stroke. Grau 2004. N= 303cases, 468 controls

### Periodontitis and cerebral ischemia

- Severe loss of attachment was asso with a 4X higher Odds Ratio than those w/o periodontitis.
- Severe radiographic bone loss was asso with a 3X higher Odds Ratio than minimal to no bone loss.
- Bleeding gums resulted in a 15-fold increase in risk compared with those with minimal to no bleeding.

Dorfer JCP 2004

Case control, n=603

### AAP Systematic Review Findings 2003:

- 4/5 case control studies found a positive asso between poor oral health and CVD.
- 11/15 Xsec studies found a modest asso between periodontitis and CVD
- 4 studies found a positive asso between periodontitis and stroke.

### Conclusions on Periodontitis and CVD:

•CVD is multifactorial and periodontitis contributes to a certain amount of cases along with other exposures or influences (smoking, dm, BMI, stress, HTN, and hypercholesterolemia). Beck 1998

•Common risk factors/confounders could lead to an association in the absence of a causal association: (Lack of rigorous control for smoking history, health awareness and compliance, and sample size. Hujuel 2002

•Recommendations for perio treatment on the basis of potential CVD outcomes remains premature. CDC 2005



### Oral Disease and Systemic Disorders

Periodontitis has an association with:

- Infective Endocarditis
- Diabetes
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- Pre-Term, Low Birth Weight Infants
- Pulmonary Disease
- Others

### Oral Disease and Systemic Disorders



PTLBW infant treatment in hospitals for respiratory distress, jaundice, malnutrition, anemia, CP, etc. costs over \$5 billion annually.

### Oral Disease and Systemic Disorders

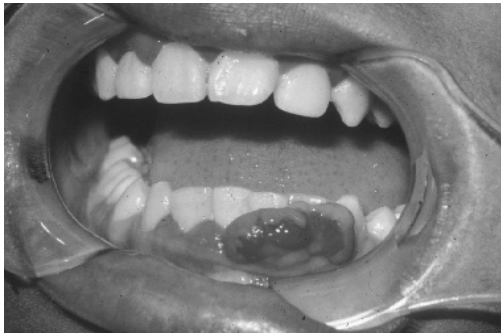
#### Pre-Term, Low Birth Weight Infants:



### Oral Disease and Systemic Disorders Periodontitis and pregnancy



### Oral Disease and Systemic Disorders Periodontitis and pregnancy



### Oral Disease and Systemic Disorders Periodontitis and risk to pregnancy/fetus

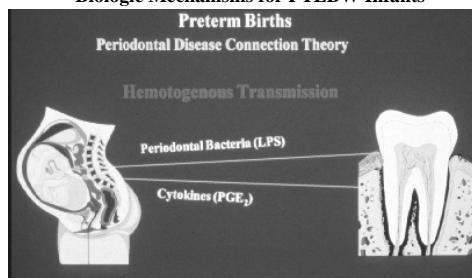
- Pregnancy increases risk for gingivitis and periodontitis, and can accelerate attachment loss, through local increases in:

Vascular permeability	PMNs in the sulcus
PgE2	Bacteroides species
GCF flow	

Kaulkwarf 78, Kornman 80, Lief 2004

- Is the relationship 2-Way, like with diabetes? Can periodontitis increase risk for adverse pregnancy outcomes?

### Biologic Mechanisms for PTLBW Infants



Entry of inflammatory products (PGE2, IL-6, TNF- $\alpha$ ), endotoxin, and/or periodontal bacteria into the bloodstream and their translocation to the fetus and decidua tissues

### Biologic Mechanisms

Infection in the chorioamnion may be a cause of pre-term birth. **NEJM, Hillier 1988**

Infection with *P. gingivalis* increased PgE2 and TNF- $\alpha$  and appeared to be asso. with decreased fetal birth weight in the hamster. **Collins, Infect Immun 1994**

PgE2 levels in gingival crevicular fluid was sig higher in mothers of LBW infants than in controls. The lower the birth weight, the higher the PgE2. **Offenbacher 1998**

Maternal *C. rectus* infection in mice induces placental inflammation and increased pup mortality **Offenbacher 2005**

### Clinical Studies

**Periodontal Infection as a Possible Risk Factor for Preterm Low Birth Weight.** n=93 PTLBW, 31 normal

**The risk for preterm labor requiring medical intervention or premature rupture of membranes (<36 weeks), or low birth wt. Infants (<2500 grams), was greater if the mother had periodontitis:**

- PTB- OR 7.9
  - LBW- OR 7.5
- (after controlling for smoking, race, alcohol use, age, nutrition, and genitourinary infection.)

Offenbacher 1996

### Biologic Mechanism- Immune Response

Maternal periodontal infection in the absence of a protective maternal antibody response is asso with systemic dissemination of oral organisms that translocate to the fetus resulting in prematurity.

Highest rate of prematurity of 67%:

- Maternal periodontal infection
- Decreased IgG response to some periopathogens
- Strong IgM fetal response to other periopathogens (fetal cord serum samples)

Madianos Annals of Perio 2001

### Biologic Mechanism- Immune Response

Expectant mothers (weeks 15-20) at risk for complications had perio exams and oral plaque and amniotic fluid sampling:

- The presence of oral pathogens was asso with PTB.
- Bacteria were never found in the amniotic fluid.
- In amniotic fluid, IL-6 and PgE2 were asso with oral bacteria.

#### Conclusions:

1. Pregnant women with elevated amniotic fluid levels of PgE2, IL-6, and IL-8 in the 15-20 weeks of pregnancy and with periodontitis are at high risk of PTB.
2. Periodontitis can induce a primary response in the chorioamnion leading to PTB.

Dortbudak JCP 2005

**Maternal periodontitis is an independent risk factor for PTB, LBW, and fetal growth restriction.** 5 Year prospective study. n= 814

Perio exams <26 weeks and w/i 48 hrs postpartum.

Prevalence of births for gestational age <28 weeks:

- Perio healthy - 1.1%
- Mild periodontitis- 3.5%
- Mod-severe perio- 11.1%

Prevalence of LBW deliveries at < 1000 grams

- Perio healthy- 0%
- Mild periodontitis- 6.1%
- Mod-severe perio- 11.4%

Periodontitis incidence/progression during pregnancy was asso with sig smaller births for gestational age

Offenbacher 2001

### Oral Disease and Systemic Disorders

**The risk of PTB increases when severe periodontitis exists in the mother.**

**Those with the most severe class of prematurity were more likely to have severe periodontitis during the 2<sup>nd</sup> trimester (21-24 weeks).**

- Adjusted OR 4.45 at 37 weeks
- Adjusted OR 5.28 < 35 weeks
- Adjusted OR 7.07 < 32 weeks

Jeffcoat 2001

**The Relationship Between Periodontal Disease in Pregnant Women and the Nutritional Condition of their Newborns.**

The more severe the mother's periodontitis:

- the lower the birth weight.  
(Most sig in those with the severest periodontitis)
- the less the gestational age.  
(After controlling for traditional risk factors. N=82)

**Conclusion: Periodontal disease in pregnant women could be a clinically significant risk factor for preterm delivery and low birth weight.** Romero JP 2002

### **The correlation between LBWI and mother's periodontal status:**

In women > age 25:

- The more severe the mother's periodontitis: the lower the birth weight.
- Bleeding gums was asso with LBW infants

Marin JCP 2005. Brazil. N=152

Periodontitis is asso. with LBW, but not PTB.

(As measured by probing depths)

Moreu JCP 2005. Spain. N=96. P=.0038

### **Preterm birth and mild periodontitis**

- Odds Ratio for PTB was 5.46 in healthy postpartum women when most sites demonstrated bleeding on probing and there was at least one 4mm pocket in comparison to those periodontally healthy.
- PTB rate was 46% in those with mild perio vs 11.4% in those periodontally healthy.

Radnai JCP 2004.

Case control n=85.

No smokers in the data

### **Contradictory Clinical Studies**

No asso. found between maternal perio disease and increased risk for PTLBW infants. (OR 0.78)

PTLBW was asso. with HTN (3.25), previous LBWI (2.53) and smoking (2.15)

**Davenport 2002**

(Adjusted for maternal age, ethnicity, maternal education, smoking, alcohol consumption, infections, and hypertension.) Case control study with 236 cases of PTLBW and 507 controls. Multi-ethnic UK population.

No asso. was seen between mild periodontitis and pregnancy outcomes after adjustment in another population in England.

**Moore 2004, 2005**

### **Periodontitis, Pregnancy and Hypertension**

**Women with severe perio during pregnancy had increased risk of developing preeclampsia compared to those with gingival health:**

- Perio healthy at delivery- 3% developed preeclampsia
- Mild periodontitis at delivery- 5%
- Severe periodontitis at delivery- 10% (OR 2.4)

Boggess, 2003 Obstet Gynecol, n= 763 births

**Preeclamptic women had greater periodontal disease and inflammatory mediators (PgE2, TNF-  $\alpha$ , IL-1B) compared to matched controls.**

Barak 2005 J Perio, n= 30

### **Intervention Studies-PTLBW Infants**

Young pregnant minority women in NYC.

- PTLBW mothers had sig higher levels of periopathogens than women with normal birth outcomes.
- Nonsurgical perio therapy during pregnancy reduced the rate of PTLBW infants from 18.9% to 13.5%. (N= 74 received periodontal tx; 90 no tx till after delivery.)

**Subgingival infection with biofilm rich in Gram negative, LPS producing species may play an etiologic role in the pathogenesis of PTLBW infants.**

Mitchell-Lewis 2001

### **Intervention Studies-PTLBW Infants**

**In pregnant mothers with periodontitis, perio therapy reduces the risk of PTLBW infants:**

- Control (no perio therapy)- Incidence 10.11%
- Therapy before 28 weeks gestation- Incidence 1.84%

Periodontitis was the strongest risk factor for PTLBW (OR 4.70), compared to previous PTLBW (OR 3.98), <6 prenatal visits (OR 3.70), and maternal low wt.gain (OR 3.42).

**Periodontitis is an independent risk factor for PTLBW, and perio therapy reduces the rates of PTLBW.**

Lopez 2002, n=351

### Intervention Studies-PTLBW Infants

In pregnant mothers with **gingivitis**, perio therapy reduces the risk of PTLBW infants:

- Control (no perio therapy)- Incidence 6.71%
- Therapy before 28 weeks gestation- Incidence 2.14%  
(Adjusted OR 2.76, p= 0.008)

Periodontal therapy reduces the rate of PTLBW infants in women with pregnancy-associated gingivitis.

Lopez 2005, n=870

### Intervention Studies-PTLBW Infants

Perio therapy at 21-25 weeks gestation reduced the rate of spontaneous PTB at < 35 weeks:

No perio rate 6.3%

Perio therapy

Prophy rate 4.9%

SRP + Met rate 3.3%

SRP rate 0.8%

Jeffcoat 2003

n=366, w 723 controls

### Conclusions- Periodontitis and PTLBW Infants

- Periodontitis appears to be an independent risk factor for pre-term delivery.
- There is a clear need for more well designed observational and intervention studies to confirm observations.

Systematic ROL, Scannapieco 2003



### Intervention Studies-PTLBW Infants

Ongoing Phase III multicenter intervention studies, investigating the effects of scaling and root planing on expectant mothers'

- Preterm birth rates
- Weight for gestational age
- Immune response
- Neonatal morbidity and mortality
- Inflammation

U of Minnesota n= 816 completion 7/06

U of North Carolina n= 1800 completion 8/07

### Periodontitis and pregnancy

#### Cost Benefit analysis:

- Normal pregnancy \$4,982
- Premature infant **without** med complications \$78,583
- Premature infant **with** med complications \$200,000+

"If scaling and root planing can reduce risk, it would seem to be a good investment."

Compton, State of MA  
2001

### Dental Considerations

- Preventive oral care services should be provided as early in pregnancy as possible.
- If exam indicates a need for periodontal therapy, these procedures should be scheduled early in the 2<sup>nd</sup> trimester.
- The presence of acute infection, abscess, or other potentially disseminating sources of sepsis may warrant prompt intervention, irrespective of the stage of pregnancy.

American Academy of Periodontology Report 2004

**Expectant mothers should be counseled in the importance of oral health.**



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#### Oral Disease and Systemic Disorders

What is the relationship between oral bacteria and pulmonary disease?



Aspiration of bacteria, not blood dissemination

#### Biologic Mechanisms-Pulmonary Disease

- Many oral bacteria can be aspirated into lower airways and are strongly associated with bacterial pneumonia.
- Saliva enzyme activity increases in periodontitis, promoting adhesion and colonization of pathologic bacteria in the oropharynx.
- Cytokine release in periodontitis can promote periodontal pathogen and H. influenza adhesion and colonization of mucosal surfaces, with additional cytokine release from epithelial cells, with neutrophil recruitment, epithelial damage and infection.

#### Oral Disease and Systemic Disorders

Poor oral hygiene (by OHI)  $\xrightarrow{\text{Asso. with}}$  COPD  
Chronic bronchitis  
Emphysema  
OR 4.5 when the worst OHI score present vs the healthiest.  
NHANES I, Scannapieco 1998

Mean Attachment Loss ( $\geq 3$  mm)  $\xrightarrow{\text{Asso. with}}$  COPD  
Chronic bronchitis  
Emphysema  
OR 1.45 (Adjusting for education, income, dental tx history, alcohol use, dm, and smoking.)  
NHANES III, Scannapieco 2001

#### Oral Disease and Systemic Disorders

Worst radiographic alveolar bone loss  $\xrightarrow{\text{Asso. with}}$  Incident COPD

Relative Risk 1.77

VA Normative Aging Study  
25 year F/U. Hayes 1998

When analyzed later by smoking status:

Current smokers	RR 1.63
Never smokers	RR 1.19

Hyman JPeriodontol 2004

### Intervention Studies-Pulmonary Disease

ICU patients with dental plaque accumulation were more likely to develop nosocomial pneumonia compared to those without plaque (0.2% CHX gel 3X/day).

Nosocomial rate 17/30 vs 8/30. Fourrier 2000

Over 2 years, nursing home residents with poor OH (control) had a 19% incidence of pneumonia compared to 11% in those with assisted OH ( $p < .05$ ) and a 16% vs. 8% pneumonia related mortality rate ( $p < .01$ ).

Yoneyama 2002

### Oral health and respiratory infection

- An antibiotic solution, swished and swallowed or injected into the retropharynx daily reduced ventilator asso pneumonia (incidence 16%) vs a placebo group (incidence 78%). Pugin, JAMA 1991
- Incidence of nosocomial infection in ICU patients was reduced by 65% and RTI by 69% with a daily chlorhexidine rinse. DeRiso, Chest 1996
- The mortality rate from aspiration pneumonia in elderly nursing home persons receiving once a week assisted oral hygiene was sig. lower.

Adachi, Oral Surg, 2002

### Review: Oral health and respiratory infection

- 12 studies provided direct evidence of an asso between pulmonary infection and oral disease.
- Asso was seen in patients with poor health, the frail elderly, and patients with COPD.
- Improving oral hygiene might reduce the risk of pneumonia among subjects at risk.
- Smoking appears to be a strong co-factor in the association.

Mojon, ROL 2002



### Oral Disease and Systemic Disorders

Periodontitis has an association with:

- Infective Endocarditis
- Diabetes
- Cardiovascular Disease
- Pre-Term, Low Birth Weight Infants
- Pulmonary Disease
- Others- Rheumatoid Arthritis; Alzheimer's; Chronic pain

### Oral Disease and Systemic Disorders

*Other Explanations for Systemic Disease Susceptibility are Common Risk Factors:*

- Age
- Diet
- Smoking
- Alcohol use
- Health behaviors/habits
- Gene polymorphisms/hyperinflammatory trait
- Stress
- SES



## Oral Disease and Systemic Disorders

*Some skeptics feel potential biases exist within the dental community:*

- Researchers and universities- Grant dollars
- Busier dental practices -Periodontitis and caries ↓
- Dental benefit plans- MDs rec dental care, increasing demand for dental services and plans.

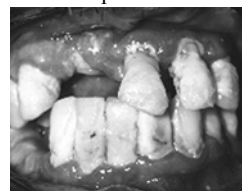
Hamilton, CDAJ, 2005

## Oral Disease and Systemic Disorders

### The Medical Provider's Role:

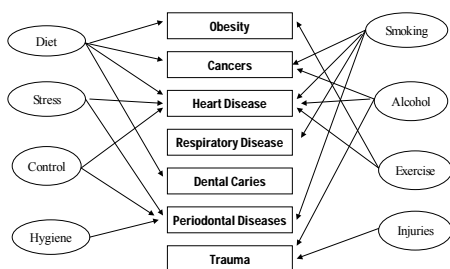
- Know the signs of perio disease
- Ask the date of the last dental exam
- Encourage patients to practice good oral hygiene
- Develop a good working relationship with the patient's dentist.

Altenberg 2006



## Oral Disease and Systemic Disorders

### Common Risk/Health Factor Approach



Sheehan & Watt, 2000

### Periodontal Disease Quick Screening Tool

Periodontitis has an association with:  
 • Diabetes  
 • Infective Endocarditis  
 • Cardiovascular Disease  
 • Pre-Term, Low Birth Weight Infants  
 • Pulmonary Disease



Severe Periodontal (Gum) Disease      Severe Gum Disease with Recession

Intermediate Screening Signs & Questions

Screening Signs of Periodontal Disease

• Loose Teeth

• Red, Swollen, Bleeding, or Receding Gums

• Pus-like Discharge & Unpleasant Odor, Chewing

SCREENING QUESTIONS

• Do your gums bleed, especially when you brush or floss your teeth?

• Are any of your teeth loose?

• Do you have bad breath, or have told you have bad breath?

• Do you have a bad taste in your mouth that won't go away?

• If you have young children, are you aware that bad breath from your

Joint collaboration between:  
 IHS Division of Oral Health  
 IHS MCH Consultant  
 IHS Health Educator Consultant

Poster  
 for placement in primary  
 care/medical wait rooms for  
 providers and patients to see

## In Summary

- Oral health is important to general health (Surgeon General's Report), and is not less important and separate from general health.
- Not only are patients with DM more susceptible to periodontitis, but the presence of periodontitis may negatively affect glycemic control. Without oral health, it may be difficult to control Type 2 DM.
- Periodontitis can't be considered a cause of CVD or stroke yet, but can be considered an additional risk factor, with consistent findings of increased odds ratios and significant probability values.

## In Summary

- Periodontitis is a strong, independent risk factor for pre-term birth, and periodontal treatment prior to the 3<sup>rd</sup> trimester may decrease the risk.
- Poor oral hygiene and periodontal bone loss can increase the risk of chronic and acute respiratory illnesses, particularly bacterial pneumonia.
- Though recommending periodontal treatment to reduce risk for these diseases remain premature, treatment can reduce the cumulative systemic pathogen and inflammatory burden.

## Questions?



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Presentation at [home.dentist.ihs.gov](http://home.dentist.ihs.gov).  
Click on Edit-edit slides, then View-notes page

## Questions?



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